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WO #5

PROPOSAL FOR THE DEVELOPMENT OF A SYSTEM



OF RECIPROCAL ORIENTATION ON THE GROUND

## I. INTRODUCTION.

The instrumentation under consideration consists of two thermo-optical devices capable of transmitting and receiving infrared waves and interaudio communication. The basic purpose of the instruments is communication between two people who may be separated any distance up to six miles. The proper function of the portable instruments for communication requires that the axes of the thermo-optical system of the two instruments be reciprocally oriented on each other.

## II. PURPOSE OF PROPOSAL.

The purpose of this proposal is to provide a system of mutual orientation that will give first consideration to exploitation of the thermo-optical system as it is now designed (for the basic purpose of intercommunication) and second consideration, in the event the first is not possible or practical, to the design of an auxiliary device that will not add substantially to the weight, volume, or operational difficulties of the present system.



## III. PROPOSAL.

[redacted] proposes to develop a system or procedure for reciprocal orientation that will utilize a simple auxiliary device that will not add substantially to the weight, volume, or complexity of the present communication equipment. The following three methods will be analyzed for their adaptability to the reciprocal orientation requirements:

(1) Magnetic System

It is proposed to evaluate system performance based on utilizing magnetic compasses, circles, levels, maps (up to 1:100,000), and photographs. Performance of the system will be considered with and without the magnetic influence of the communication equipment.

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(2) Star Graphic System

The application of precomputed star azimuths obtained from star altitude tables will be considered as an alternate procedure for determining azimuth. Equipment similar to that utilized with the Magnetic System will be employed.

(3) Optical System

The principles of optical auto-collimation will be considered as a means of reciprocal orientation in terms of simple auxiliary devices such as auto-collimating eye piece and a three cornered mirror.

Emphasis in this analysis will be placed on cost, reliability, commercial availability of equipment.

This proposal involves design and procedure but does not involve material or include the construction of a prototype.

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TRANSISTOR SYSTEM

AMPLIFIER A.

1. The response should have a rising characteristic with frequency; preferably, it should rise at a rate of 12 db per octave from 300 to 3000 cps.

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2. The amplifier shall be capable of delivering 0.65 watt, 3000 cps, at no greater than 10 percent total harmonic distortion into a 15-ohm resistive load. The power output required falls from 0.65 watt at 3000 cps to 0.1 watt at 1500 cps. From 1500 down to 300 cps the amplifier shall be capable of delivering 0.1 watt.

25X1

3. The amplifier shall be so designed that the maximum continuous power that can be delivered to the 15-ohm resistive load can never exceed 0.8 watt.

4. The amplifier shall operate from an American Type DD-4 dynamic microphone. The amplifier gain shall be such that 0.75 mv at 1000 cps input gives 0.1 watt output. The signal to noise ratio under these conditions shall be 40 db or greater.

5. If the conditions of 4 above cannot be met the use of a carbon microphone such as Navy type NAF213264-6 should be considered.

6. A gain control shall be provided in the experimental model amplifier.

OSCILLATOR.

Two oscillators one at 2000 cps for supply — other at 1000 cps for tone

A 1500 cps oscillator shall be included and means provided for connecting its output for either of two functions.

1. In one condition the oscillator output shall be suitably transformed, rectified, and filtered to provide 150 volts DC ±10% at 1 ma. The ripple shall be below the random noise of the supply, measured when the supply is delivering 1 ma into a deposited carbon resistor load. (This supply will be used for powering the cell of amplifier B. Since possibly three cells may be used in series, 150 volt is specified.)

Changed to 0.3 ma

2. In the other condition the oscillator output shall be connected to amplifier A in such a way that a continuous voltage of 1500 cps +10% is delivered to the 15-ohm load. The level should be such that 0.1 watt at no more than 10% total harmonic distortion is developed.

**AMPLIFIER B.**

1. The response shall be flat ±2 db from 300 to 3000 cps.

2. The output stage shall be designed to drive one Telex headset. It may be designed for either the type 3778 (1000 ohms) or the type 3736 (64 ohms). It shall be capable of delivering sufficient power at no greater than 10% total harmonic distortion to provide an acoustic output greater than 100 db above 0.0002 dynes per sq cm over the frequency range of 300 to 3000 cps.

3. The amplifier input will be a lead sulfide cell whose dark resistance is approximately 400K ohms. The amplifier noise shall be as far below that of the lead sulfide cell as possible, preferably at least 12 db.

4. The gain of the amplifier shall be such that the noise of the cell will provide an acoustic output of at least 100 db above 0.0002 dynes per sq cm. A gain control shall be provided.

**POWER SUPPLY.**

If possible the above amplifiers and oscillator should be capable of operating from a single 6-volt battery source.

vibrator power supply